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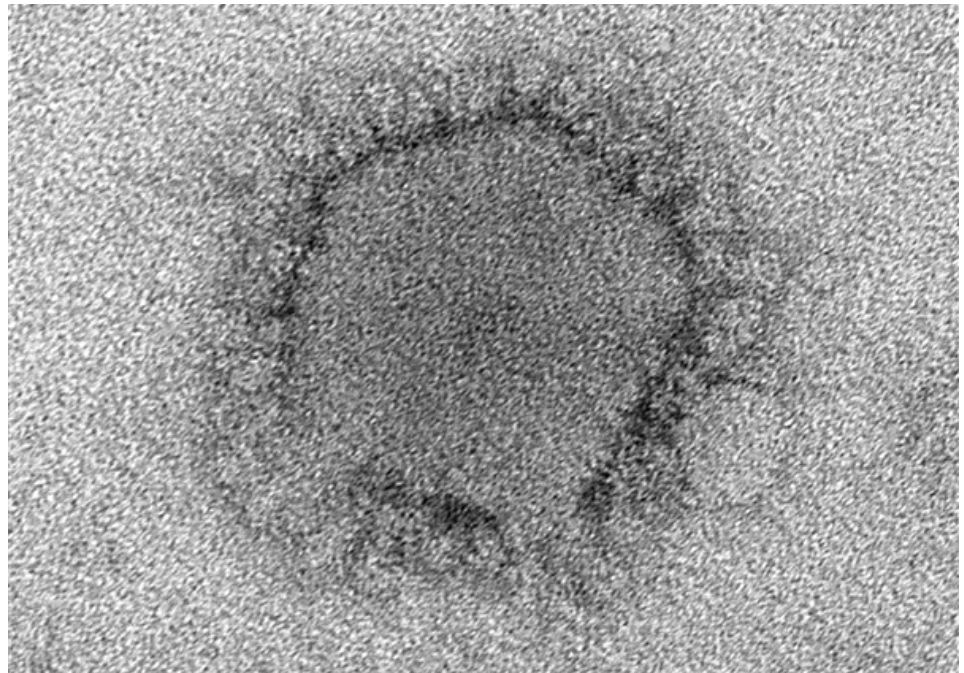
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Navy Lab in Cairo Identified First Cases of Middle East Coronavirus

Story by Cheryl Pellerin, American Forces Press Service



This highly magnified transmission electron micrograph created in 2013 shows the ultrastructural morphology of the Middle East Respiratory Syndrome Coronavirus, or MERS-CoV, identified in 2012 as the cause of respiratory illness in people. Investigations are ongoing to discover the source of MERS-CoV and how it spreads. (CDC photo by Cynthia Goldsmith and Azaibi Tamin)

WASHINGTON - A Defense Department-funded lab in Egypt detected the earliest-known cases of Middle East Respiratory Syndrome virus, a new coronavirus strain that is infecting people on the Arabian Peninsula, an expert from DOD's global disease surveillance system said.

The lab shared samples so the Centers for Disease Control and Prevention could develop tests for the virus, said Public Health Service Capt. Michael J. Cooper, head of respiratory disease for the Global Emerging Infections Surveillance and Response System, called GEIS, which is part of the Armed Forces Health Surveillance Center.

GEIS is a funding agency that supports military laboratories in the United States

and in Egypt, Germany, Kenya, Peru, Thailand and Singapore -- all of which serve as hubs for infectious disease surveillance and as regional hubs for addressing global public health issues -- and it funds respiratory disease surveillance projects at 400 sites in more than 30 countries.

As of May 9, the World Health Organization, or WHO, reports 536 laboratory-confirmed cases of MERS-CoV since April 2012, including 145 deaths. Some people infected with MERS-CoV develop severe acute respiratory illness with symptoms of fever, cough and shortness of breath, and about 30 percent of known cases die, according to the CDC.

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NMRC Commanding Officer's Message

As most of you know, Secretary of Defense, Chuck Hagel recently ordered a comprehensive review of the entire Military Health System to assess access, safety, and quality of care. I don't expect this review to have a direct impact on our Research Commands, but it does provide us with another good reminder that we should be assessing how we are doing business and working to improve those processes.

I anticipate working with the eight laboratory commanders over the next several months to evaluate administrative and science support processes as well as research activities. We will be establishing some working groups and tasking them with answering some questions for us about how well we are functioning as an enterprise and identifying some ways we can improve our processes and research collaborations.

Each month as I review the articles in this newsletter, I am impressed by both the quality of research at our various commands and the diversity of the work that is taking place. For example, this month we touch on subjects ranging from the development and deployment of MERS-CoV testing, to work on nanoparticle fibers to reduce infections on cranial implants, to cutting edge developments in hypo- and hyperbaric medicine.

I hope as we conduct this current assessment of our practices, we will be able to strengthen the systems to facilitate this sort of important work and increase our communication and coordination across our enterprise.



NMRC Commanding Officer sends,
John. W. Sanders III, CAPT, MC, USN

NAMRU-SA Commanding Officer's Message



Over the past year, NAMRU-SA established its first ever Postdoctoral Fellowship program, which offers a novel training experience beyond academia and industry to recent doctoral program graduates. Specifically, the program allows Postdoc Fellows to engage in mentored research to acquire the professional skill sets they need to pursue a desired career. The program offers a taste of military culture, state-of-the-art research facilities, and an opportunity to conduct research focused on improving the lives of our wounded warfighters.

Currently, NAMRU-SA has seven Postdoc Fellows on board, each of whom brings a unique skill set to the command. The diverse group includes those with backgrounds in bioengineering, cell biology, chemical engineering, immunology, microbiology, and physiology. Some of the current products under investigation by our Postdoc team include a device to rapidly detect microorganisms, a rechargeable field-ready ozone sterilizer, hemorrhage treatments, antimicrobial wound dressings, and a laser-induced photo-acoustic method to destroy bacteria.

In addition to their research learning experience, two times a month Fellows either lead a journal article discussion or give oral presentations highlighting their current research projects. Some of these presentations are also given at the monthly All Hands Call meetings, granting the NAMRU-SA administrative team perspective on how their essential support directly contributes to the command's research.

These events encourage Postdoc Fellows to increase their public discourse with both scientific and general audiences. Fellows are also able to participate in additional training opportunities including technical writing workshops, lab equipment training, and statistics seminars. Additionally, on a broad scale, Fellows gain a wealth of knowledge about the Navy and Navy Medicine. This specific knowledge has led two of our Postdocs to seek commission as Naval Officers in the Medical Service Corps. Not only are we very excited to provide this opportunity to a new generation of scientists, but we are also able to invigorate our command with intellectual energy, foster the generation of new scientific ideas, and develop and improve solutions for the warfighter.

NAMRU-SA Commanding Officer sends,
Rita G. Simmons, CAPT, MSC, USN

Navy Lab in Cairo Identified First Cases of Middle East Coronavirus

(continued from page 1)

Some people exposed to the virus get only a mild respiratory illness, the CDC reported.

A CDC fact sheet says MERS-CoV has spread between people in close contact and from infected patients to health care workers. Clusters of cases in several countries are being investigated, as is the source of the new strain, the CDC says.

MERS-CoV has been found in camels in Qatar, Egypt and Saudi Arabia, and in a bat in Saudi Arabia. Camels in other countries have tested positive for MERS-CoV antibodies, meaning they have been infected with MERS-CoV or a closely related virus. But CDC says it needs more information to identify the potential roles of camels, bats or other animals in MERS-CoV transmission.

On May 2, CDC reported the first confirmed U.S. case of MERS-CoV in a health care worker traveling from Saudi Arabia to London to the United States. The patient was hospitalized in Indiana and at the time was in stable condition, CDC officials said. During a recent interview with American Forces Press Service, Cooper said, “[GEIS’s] first objective is force health protection” for U.S. troops, “but we are also involved with global public health issues.”

He added, “We also do surveillance on diseases that aren’t necessarily militarily relevant but are relevant to global public health because sick people can board aircraft and carry infectious diseases anywhere in the world within 24 hours.”

One of GEIS’s funded laboratories is the Naval Medical Research Unit-3, or NAMRU-3, the largest DOD overseas lab, formally established in Cairo in 1946.

Scientists there conduct research on a range of diseases and perform infectious disease surveillance to support military personnel deployed to Africa, the Middle East and Southwest Asia.

NAMRU-3 also works closely with the Egyptian Ministry of Health and Population, the U.S. National Institutes of Health, WHO and CDC, and is a WHO regional Collaborating Center for HIV and Emerging Infectious Diseases.

Cooper said GEIS funds the Jordan National Influenza Center, called the NIC, and that NAMRU-3 and members of the Jordan Ministry of Health and the NIC work together often. The story of MERS-CoV, although the first case reported to WHO was from Saudi Arabia in September 2012, really began in Jordan earlier that year, Cooper explained.

“In April 2012 there was an outbreak of severe acute respiratory illness in a Jordanian hospital -- we call them SARI cases -- and the folks at the Ministry of Health in Jordan asked NAMRU-3 to help with the outbreak investigation,” he said.

Eleven people were hospitalized, he said. Eight of them were health care workers. NAMRU-3 team members arrived and took samples from the patients, but back at the lab in Cairo they could find no pathogen at that time, he said. MERS-CoV hadn’t yet been discovered, so no specific test for it existed.

On April 24, the NAMRU-3 team told the Jordan Ministry of Health that all samples tested negative for known coronaviruses and other respiratory viruses. The samples were saved at NAMRU-3.

“Flash forward to September 2012, London, England,” Cooper said.

On Sept. 11 that year, a 49-year-old Qatari man with a history of travel to Saudi Arabia was flown by air ambulance from Qatar to a London intensive-care unit. He suffered from acute respiratory infection and kidney failure. Eleven days later, on Sept. 22, the U.K. Health Protection Agency reported to WHO that it had compared information from the U.K. Qatari patient with that of a virus sequenced earlier in the year by Erasmus University Medical Centre in the Netherlands. This earlier sample,

from lung tissue of a 60-year-old Saudi man who had died in June, was a 99.5 percent match with the new coronavirus strain from the Qatari man, according to a Sept. 23 WHO Global Alert and Response document.

Now, WHO had two confirmed cases of the new strain. The news “caused a lot of concern,” Cooper said, “because the last time the world saw an emerging coronavirus strain was 2002-2003, and it was severe acute respiratory syndrome -- SARS -- which caused about 8,000 cases and 780 deaths” in more than 24 countries.

“In October we decided to ask our partners at four different locations to do retrospective surveillance for all their samples that were associated with respiratory illness,” he said.

The partners were NAMRU-3 in Cairo, Landstuhl Regional Medical Center in Germany, U.S. Army Research Unit-Kenya in Africa and the U.S. Air Force School of Aerospace Medicine at Wright Patterson Air Force Base in Ohio.

“Then NAMRU-3, remembering the outbreak in Jordan in April,” Cooper said, retested the Jordan samples from April. By November 2012 the NAMRU-3 team provided lab results that confirmed two of the original 11 cases as infections by the novel coronavirus.

“Now the NAMRU-3 team understood that what they had back in April 2012 was the earliest known outbreak of this emerging infection,” Cooper explained.

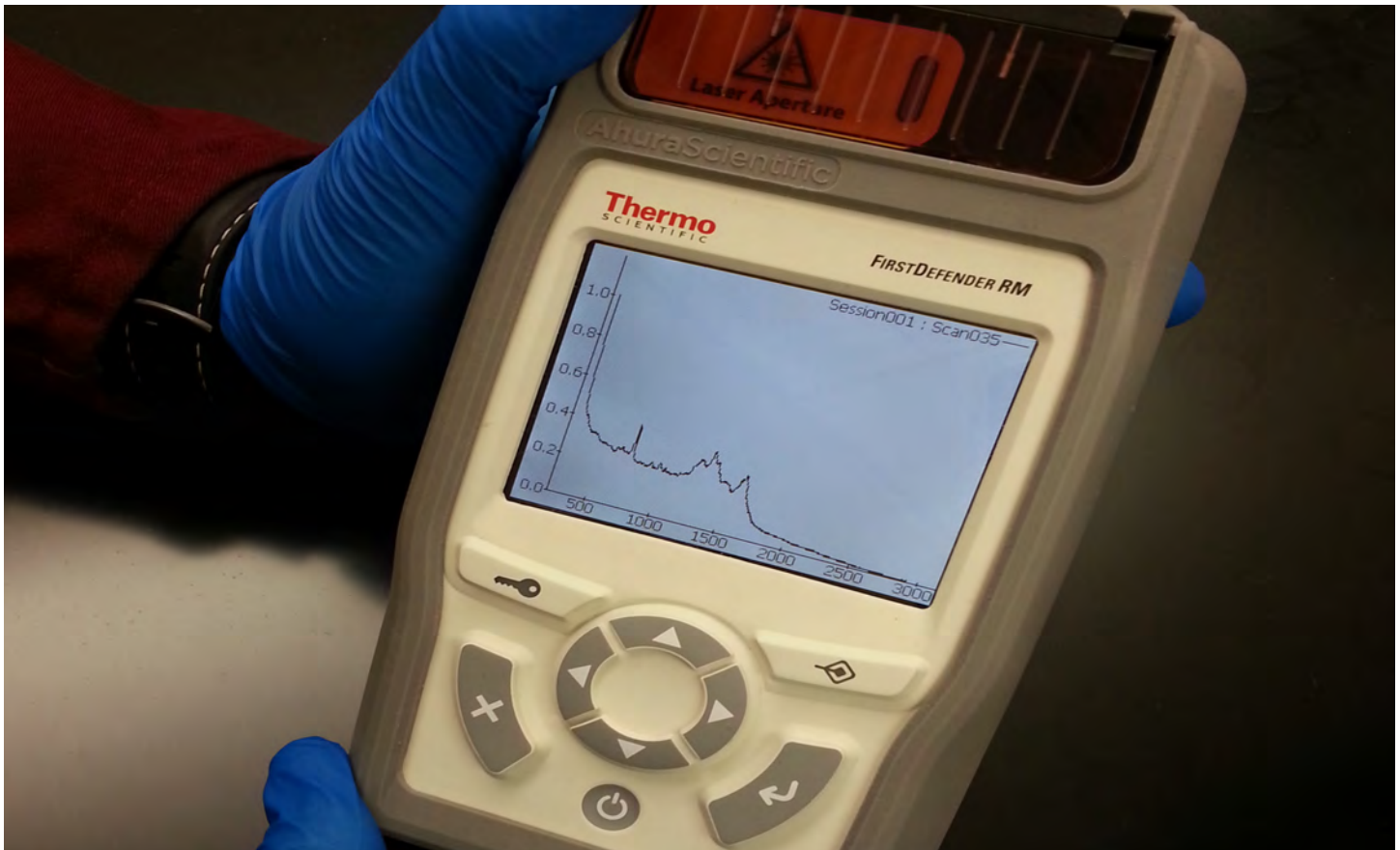
“Until then,” he said, “the vast majority of cases had come out of Saudi Arabia. If we had never found the earliest cases, Jordan wouldn’t even be in the mix. And you’d like to know the earliest cases to get an idea of where [the new strain] is coming from.”

NAMRU-3 then shared samples from the earliest MERS-CoV cases with CDC, Cooper said, “so an assay, or test, could be developed, which is very important. Now

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NAMRU-SA Evaluates Nanotechnology and Biosensors for Rapid, Point-of-Care Diagnosis of Infectious Pathogens

Story by Dr. Christian Kotanen, Postdoctoral Fellow, NAMRU-SA Public Affairs



The hand-held Raman spectrometer displaying the biomolecular fingerprints of an infectious pathogen. (Photo courtesy of NAMRU-SA Public Affairs)

SAN ANTONIO - Infections often accompany trauma and injury, and may have a negative impact on morbidity and mortality rates for the wounded warfighter.

Scientists at the Naval Medical Research Unit San Antonio (NAMRU-SA) are investigating nanotechnology-based biosensors to reduce complications of trauma-related infection and fulfill the existing technological gap of diagnostics in the field.

The biosensor currently being investigated utilizes Surface Enhanced Raman Spectroscopy (SERS), a technique capable of generating unique biomolecular fingerprints or barcodes for bacteria based on how visible light scatters off of the cell surface.

Bacterial samples are placed on microscope slides coated with silver nanorods, which enhance the Raman light scattering intensity, and are measured with a battery powered, handheld spectrometer that produces a graphical readout. Identification of purified bacteria can be performed in less than one minute.

NAMRU-SA scientists recently evaluated the SERS biosensor for its effectiveness in identifying bacteria in human serum samples. A reference library of SERS barcodes was successfully generated for five different species of bacteria.

So far, of the five species, scientists have been able to detect and identify pathogenic species of *Staphylococcus aureus* and *Acinetobacter baumannii* in a timeframe of two hours using the handheld SERS,

including the time it takes for basic sample preparation.

Because extraction of bacteria and sample preparation are not possible for the SERS biosensor system, future studies aim to expand the identification capability of the SERS biosensor to other bacterial species in clinically relevant samples and minimize or entirely eliminate the need for sample preparation. The use of SERS has the potential to be a rapid and sensitive means for early diagnosis of bacterial agents.

Researchers at NAMRU-SA envision a 'lab-on-a-chip' capable of accepting biological samples with processing, SERS measurement and data analysis being performed by a single piece of hardware.

Navy Lab in Peru Publishes Major *Plasmodium Vivax* Malaria Research to International Accolades

Story by Andres G. Lescano, NAMRU-6 Public Affairs



Dr. Antonio Quispe at the Johns Hopkins Bloomberg School of Public Health (Photo courtesy of NAMRU-6 Public Affairs)

LIMA, Peru - Historically, malaria has been the infectious disease of greatest impact on deployed U.S. troops. *Plasmodium falciparum* is considered the more severe malaria. However, malaria due to *Plasmodium vivax* has caused greater disability and disruption of operational capacities in most military operations.

Two major articles were recently published by Dr. Antonio M. Quispe and

Dr. Solomon Durand, in the American Journal of Tropical Medicine and Hygiene from the Department of Parasitology at U.S. Naval Medical Research Unit (NAMRU-6).

For decades vivax malaria has been considered 'benign' malaria. Quispe, a Peruvian third year doctoral student at Johns Hopkins and adjunct scientist at NAMRU-6 showed that in coastal Peru, vivax malaria not only can cause

life-threatening illness in a quarter of hospitalized malaria patients but a small fraction of cases may even die.

Leading malaria expert and retired Navy Captain J. Kevin Baird commented in an accompanying editorial, "The weight of evidence now available leaves no doubt that vivax malaria in many settings often occurs in association with a pernicious and threatening course of illness."

A unique feature of *P. vivax* is its dormant liver stage, or hypnozoite, which cause "relapses" even years after exposure. Primaquine, initially tested by the U.S. Army, remains the only licensed drug by the Food and Drug Administration for the elimination of hypnozoites and prevention of relapses.

Durand conducted a clinical trial in Iquitos, Peru, and documented that a seven day course of primaquine at 0.5 mg/kg per day was equally effective and safe as a 14-day course at 0.25 mg/kg per day. The 7-day regime reduces non-compliance associated with taking multiple doses when patients are mostly asymptomatic.

Complete elimination of malaria parasites including hypnozoites is of great importance for malaria elimination, as highlighted by Dr. Ric Price from the Charles Darwin University, Australia in an editorial published together with Dr. Durand's article.

"Improved treatment of *P. vivax* malaria including severe vivax malaria is a critical research line of NAMRU-6," said Capt. Kyle Petersen, infectious diseases physician and NAMRU-6's commanding officer. "Our scientists continue to advance the health of our warfighters and contribute to global public health efforts."

The Armed Forces Health Surveillance Center sponsored the research.

NAMRU-3 Commanding Officer Surprised by Hail and Farewell at Ghana Detachment

Story courtesy of NAMRU-3 Public Affairs



The NAMRU-3 Ghana Detachment presented Capt. Buhari A. Oyoyo (2nd from left) the commanding officer with a photo during his Hail and Farewell luncheon. (Photo courtesy of NAMRU-3 Public Affairs)

CAIRO - On his last visit as Commanding Officer of U.S. Naval Medical Research Center No. Three (NAMRU-3) to the laboratory's Ghana Detachment in Accra, Ghana, Capt. Buhari A. Oyoyo was surprised by a special Hail and Farewell, May 8.

Oyoyo was involved in establishing the detachment in 2007. With most of the staff on board since then, they wanted to have a special event to demonstrate their appreciation for his support.

Fridays are the day when Ghanaians wear either their traditional Ghanaian clothing or their organization "cloth." These "cloths" are designed with an organization's logo embedded in the pattern. These cloths are also worn on special occasions or celebrations.

The Ghana Det.'s cloth is a deep green and turquoise with the repeated Ghana Det. logo. Members of the detachment designed their own outfits to wear in honor of this occasion.

Over 30 people attended the Hail and Farewell, including Col. Bel-Nono, the assistant to the Director General of the Ghana Armed Forces, along with seven collaborating professors from the Noguchi Memorial Medical Research Institute, where the Ghana Det. is housed.

The event began with an informal reception, followed by an awards ceremony. Then, the youngest member of the detachment read Oyoyo's biography and the oldest member presented him with a wooden box with the detachment's and NAMRU-3's logos flanking a photograph of the staff as a farewell memento.

NAMRU-3 works closely with the Egyptian Ministry of Health, the U.S. National Institutes of Health, the World Health Organization (WHO), the U.S. Agency for International Development, and the U.S. Centers for Disease Control and Prevention.

NAMRU-3 has been a WHO Collaborating Center for HIV/AIDS since 1987. In 1999, a Global Emerging Infections System program was established and includes public health activities and capacity building in host countries.

This led to NAMRU-3's recognition as a WHO Collaborating Center for Emerging and Re-Emerging Infectious Diseases in 2001. NAMRU-3 also serves as a WHO reference laboratory for influenza and meningitis in the Eastern Mediterranean Region.

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Graphic illustration by Mikelle D. Smith, Naval Medical Research Center Public Affairs

Navy and Army Researchers Develop Map of Mite-Borne Scrub Typhus Risk Areas

Story courtesy of Naval Medical Research Center Public Affairs

SILVER SPRING, Md. – The Naval Medical Research Center (NMRC) in collaboration with the Walter Reed Biosystematics Unit at the Smithsonian Institution and Ohio State University; created a new map of human scrub typhus cases at the VectorMap data portal (www.vectormap.org).

“Scrub typhus is an acute chigger-borne febrile disease that is endemic in the Asia-Pacific area, and was responsible for thousands of cases and hundreds of deaths in soldiers during World War II,” said Dr. Allen Richards, from the NMRC Viral and Rickettsial Diseases Department. “In spite of the availability of effective drugs it was the second leading cause of fevers of unknown origin in troops during the Vietnam conflict. To date the endemic focus of scrub typhus has been poorly defined, primarily because the disease mimics several other febrile illnesses and was prone to misdiagnosis.”

The availability of newer, non-serology-based tests such as PCR now makes it possible to confirm clinically suspected cases.

Researchers used literature reports to map probably and confirmed human cases using the MiteMap service within VectorMap. VectorMap is an online spatial database of vector (mosquito, tick, sand fly, flea, and mite) collection and disease information that can be used to map the likely risk of vector-borne diseases. For the first time, global maps of the mite vector species and infections from rodent hosts can be viewed in concert with case reports to better understand the relationship underpinning scrub typhus distribution.

“As the U.S. focus turns to the Asia Pacific region, we think this a timely development that will facilitate patient diagnosis by making the clinician more aware of the

threat in the immediate area where patients seek treatment,” said Richards.

VectorMap provides disease maps and mapped collection data and distribution models for arthropod disease vector species, including mosquitoes, ticks, sand flies, mites, and fleas, as well as the hosts/reservoirs of vector-borne disease pathogens. Collection records are searchable and downloadable, users can map and contribute their own collection data or distribution models.

NMRC’s Viral and Rickettsial Diseases Department is divided into two divisions. The primary focus of the Viral Diseases Division is on the development of a vaccine to prevent dengue fever; the main objective of the Rickettsial Diseases Division is to develop a scrub typhus vaccine.

NHRC Staff Evaluate Burkina Faso’s HIV Prevention Program

Story by Anna Hancock, Naval Health Research Center Public Affairs



SAN DIEGO - Naval Health Research Center’s Program Manager Dr. Brad Hale (2nd from right) and William Conquest (right), country advisor for Western and Central Africa with the Department of Defense HIV AIDS Prevention Program (DHAPP) speak with members of the Forces des Armees du Burkina Faso (FABF) who attended an HIV testing and counseling campaign in Bobo-Dioulasso, Burkina Faso, March 13.

Hale and Conquest visited Burkina Faso to conduct an evaluation of the HIV prevention program that supports the country’s armed forces.

The program in Burkina Faso is part of the largest global health engagement and humanitarian effort in American history with collaborative efforts between the DoD, NHRC, the Department of State, and partner nations around the world.

Command Veterinarian Talks to Elementary School Students During Career Day

Story by Doris Ryan, Naval Medical Research Center Public Affairs



SILVER SPRING, Md. The Naval Medical Research Center Veterinarian had an opportunity to speak to elementary school students about what they need to study now and continue to study if they want to be an Army veterinarian. Lt. Col. Julie Stephens-DeValle attended Career Day at the Damascus Elementary School, Damascus, Maryland, May 14.

“This was a great opportunity to expose the students to an exciting and unique career,” said Stephens-DeValle.

She was one of many presenters who set up an information booth in the school’s auditorium. Nearly 300 students from kindergarten to fifth grade could learn about the U.S. Army Veterinary Corps and what the career path is to becoming a veterinarian.

(Left) Army veterinarian, Lt. Col. Julie Stephens-DeValle speaks to children at Damascus Elementary School. (Photo courtesy of Naval Medical Research Center Public Affairs)

Navy Lab in Cairo Identified First Cases of Middle East Coronavirus

(continued from page 3)

you’ve got a positive control [for the novel MERS-CoV strain] because you have the actual sample.”

According to its fact sheet, with such samples CDC develops molecular diagnostics that let scientists accurately identify MERS cases, and it develops assays to detect MERS-CoV antibodies. These lab tests help scientists tell whether a person is or has been infected with MERS-CoV.

CDC also provides MERS-CoV test kits to state health departments so they can test for patients under investigation for MERS-CoV infection. CDC evaluates genetic sequences as they become available as well, and at NAMRU-3 scientists today grow the new coronavirus strain, sequence it and continue to work with it.

“They’ve gotten additional samples to confirm because they serve as a WHO reference laboratory for that region,” Cooper said, “and they’ve recently discovered a travel case from the Saudi Arabian peninsula to Egypt.”

NAMRU-3 also trains physicians and

scientists from ministries of health in countries such as the United Arab Emirates, Saudi Arabia, Jordan and Yemen, and in West African countries, he said, adding that the GEIS-funded training involves teaching attendees how to use the MERS-CoV assays and discussing important facts about the new coronavirus.

Cooper defines infectious disease surveillance as “basically collecting data in a systematic way so that disease levels can be monitored. Hopefully this information gives you an idea of the distribution of a given disease and hopefully helps to understand what populations are affected.”

Doing surveillance, he said, usually involves “testing people who are ill and in some cases testing people who are not ill but who may have been exposed to the virus.”

All DOD major infectious disease labs have surveillance capabilities for MERS-CoV, Cooper added, and all DOD major medical centers around the world have MERS-CoV diagnostic capabilities.

GEIS does surveillance for a range of diseases, he said, including H7N9

influenza emerging in China, enteric infections like those caused by contaminated food or water, parasitic infections like malaria, other respiratory infections like multidrug-resistant tuberculosis, and sexually transmitted infections.

Cooper said respiratory diseases are the ones that typically go pandemic because of the way they spread.

“The most recent examples are SARS and the pandemic of 2009, which was H1N1 influenza,” he said. “They spread easily from person to person and they don’t kill their hosts too soon or maybe at all.”

About MERS-CoV, Cooper said, “We were well ahead of the curve on this one and we have a very strong network of respiratory disease surveillance.”

He added, “We’ll also say this, though. We’re dealing with a virus and viruses can change and quite frankly frequently do change. So you have to monitor the situation and you have to be careful. Surveillance is key in this situation. You have to know what’s going on.”

NMRC NeuroTrauma Department Investigates Effects of Aeromedical Evacuation on Traumatic Brain Injuries

Story by Mikelle D. Smith, Naval Medical Research Center Public Affairs



The NMRC Large Animal Medevac Simulation Suite (LAMSS), fabricated at NMRC, provides a unique platform for evaluation of long-range evacuation effects on physiology and therapeutic interventions in military relevant combat injury models, which may contribute to optimization of combat casualty care and evacuation guidelines. (Photo courtesy of Naval Medical Research Center Public Affairs)

SILVER SPRING, Md., -- Researchers from Naval Medical Research Center's (NMRC) NeuroTrauma and Undersea Medicine Departments, designed and fabricated a chamber simulating medevac scenarios.

In current conflicts combat casualties on the battlefield are rapidly evacuated in fixed-wing transport aircrafts. Research has shown that damage control resuscitation on the battlefield and definitive care in the United States has greatly diminished morbidity and mortality among combat casualties. However, concerns still remain regarding effects of extended exposure to hypobaric environments during long range aeromedical evacuations, and the physiological effects that may occur in injured warfighters.

Using the chamber, referred to as Large Animal Medevac Simulation Suite

(LAMSS), NMRC has a unique platform to evaluate long-range evacuation effects, which may contribute to optimization of combat casualty care and evacuation guidelines. Fixed-wing transport aircrafts generally cruise between 30,000 and 35,000 feet, while the inside cabin pressure is equivalent to 8,000 feet to make a comfortable environment for safe travel.

"These pressure differences could potentially impact human organisms in different ways," said Dr. Anke Scultetus, a Senior Scientist in NMRC's NeuroTrauma Department. "When a person with a cold gets onto an aircraft and travels across the Atlantic, they may feel pain in their sinuses or ears due to decreased cabin pressure. Now imagine what might happen in a person who just got severely injured on the battlefield with brain injuries and possibly open wounds."

The researchers are specifically interested in the effects of in-flight cabin pressure fluctuation on traumatic brain injuries (TBI).

"Traumatic brain injury patients are of particular concern since small changes in ambient conditions such as cabin pressure and temperature could potentially have detrimental effects on the already vulnerable brain," said NMRC Polytraumatics Program Head Dr. Charles Auker, who is also a research scientist in the NeuroTrauma Department. "There is evidence that hypobaria can induce neurological symptoms in otherwise healthy persons due to altitude decompression sickness. This suggests that high altitude hypobaric conditions as well as in-flight cabin pressure fluctuations may have detrimental effects on neurologic outcome in injured patients and that aero-medical conditions and/or therapeutics can be optimized to attenuate such adverse effects."

Head of NMRC's NeuroTrauma Department, Dr. Richard McCarron coordinated with NMRC's Undersea Medicine Department under the leadership of Capt. David Regis, in the development and actual fabrication of the LAMSS.

"NMRC has a unique combination of expertise," said Dr. Auker, when asked about collaborating with Undersea Medicine. "The expertise in NeuroTrauma, large animal physiology, the physiology of pressure changes, and the engineering and [manufacturing] capabilities, [have allowed us] to design, build and operate pressure chambers."

In this ongoing study the researchers will continue investigating whether hypobaric environments during long-range medevac flights affect physiology and neurophysiology in injured personnel. Experiments using LAMSS began in January and are expected to be conducted over the next two years.

Lab in Cairo Tests for Middle East Respiratory Syndrome Coronavirus

Story courtesy of NAMRU-3 Public Affairs



Lt. Jose Garcia (far left) and Lt. Cmdr. Gabriel Defang (second from left) demonstrating their latest results with the team from NAMRU-3's Viral and Zoonotic Diseases Research Program (VZDRP). (Photo by Rafi George)

CAIRO - With the recent outbreak of Middle East Respiratory Syndrome coronavirus (MERS-CoV) throughout the Middle East, and reported in the United States, serological testing capabilities are vital in understanding just how widespread the viral illness is in a given population.

The U.S. Naval Medical Research Unit No. Three (NAMRU-3) was the first laboratory to successfully isolate the MERS-CoV virus from a patient sample originating from Jordan. After NAMRU-3's Viral and Zoonotic Diseases Research Program (VZDRP) success in isolating the novel MERS-CoV, the next step was to develop a high-throughput serological assay for lab diagnosis of the virus.

NAMRU-3's Lt. Cmdr. Gabriel Defang, whose lab isolated the virus, initiated collaboration with the Naval Medical Research Center (NMRC) in Silver Spring, Maryland, to develop, validate and train lab personnel on this new assay. As part of this collaboration, NMRC

microbiologist Lt. Jose A. Garcia came to NAMRU-3 in May to train a team of VZDRP scientists on the performance of all aspects of the assay.

This training was a critical step in the implementation of the assay with the NAMRU-3 team responsible for validation of recently collected sera from infected patients from the Middle East. By cross training VZDRP personnel on all steps of the assay, including tissue culture, ELISA, and virus titration techniques, NAMRU-3 now has the capability of performing the MERS-CoV microneutralization assay.

A total of ten VZDRP staff members participated in the training.

"The staff in VZDRP was excited to learn and highly motivated, making them easy to teach," said Garcia, "All in all, it was a great experience."

Garcia's training greatly expanded NAMRU-3's serological capabilities by providing techniques to detect antibodies

against MERS-CoV in both patient and animal samples making it an invaluable resource to Navy research.

"My staff loved the training and learned a lot. They performed techniques they had never done before and in doing so, expanded the capabilities of NAMRU-3 to provide MERS-CoV serological support and validation of this new assay, using samples already collected from infected patients," said Defang.

One of the main focuses of Garcia's laboratory at NMRC is the development and implementation of serological assays designed for the detection of antibodies against viruses such as MERS-CoV, Dengue, influenza and Chikungunya.

Serological testing allows for the detection of antibodies within serum samples to assess whether or not a person or animal has been previously infected with a certain virus.

R&D Chronicles:

Captain George Bond and the World of Undersea Research, Part II

By Andre B. Sobocinski, Historian, Bureau of Medicine and Surgery

"In the habitat at the end of a busy day looking out a port is in itself a pleasure. There's a lot to see down there if you just have the time. It was like a reversed fish bowl. You get where you recognize fish and other critters. I can remember giving all our fish names and even wondering where they were on the days when we failed to see them."

--QMC Bob Barth, Aquanaut, SEALAB I



Sealab I Aquanauts enjoying a meal – GM1 Anderson and HMC Manning. (Photo courtesy of Naval History and Heritage Command)

Capt. George Bond's research had spawned an undeniable race to establish the first underwater habitat.

In September 1962, industrialist and inventor of the flight simulator, Edwin Link launched the first and, also, the smallest of all the underwater habitats. Measuring just 11 feet tall by 3 feet wide, its sole inhabitant—diver Robert Sténuit—would spend 25 hours at 200 feet below the surface earning the distinction as the "world's first aquanaut."

Just a week later, on September 14, 1962, Jacques Cousteau launched the first of three Continental Shelf Stations (CONSHELF).

Since the beginning of Project Genesis, Bond and Cousteau had been philosophical compatriots in the cause of saturation diving and had freely shared ideas with one another.

Even the U.S. Navy Medical Department would have a special relationship with Cousteau extending back to the early 1950s.

While with the experimental diving unit, Navy medical officer Lt. Cmdr. (later Rear Adm.) Charles Waite became the first American physician to test Cousteau's self-contained underwater breathing apparatus or SCUBA.

Bond's fellow undersea medical officer, Lt. Cmdr. Charles Aquadro, served as an observer for the CONSHELF project and would later be employed by Cousteau in a civilian capacity.

In 1964, as Cousteau was filming "World Without Sun," a documentary about CONSHELF III, Bond's vision of underwater life had germinated into SEALAB. Designed by the U.S. Mine Defense Laboratory in Panama City, Fl.,

the SEALAB habitat was constructed out of two torpedo-like mine floats measuring 60 feet in length.

SEALAB would be submerged 193 feet below the surface in warm and clear waters and 30 miles southwest of Bermuda. Habitation would commence July 20, 1964.

SEALAB's "crew" included Chief Quartermaster Bob Barth, Gunner's Mate First Class Lester "Andy" Anderson, Navy physician Lt. Robert Thompson, and Chief Petty Officer Sanders "Tiger" Manning of the Hospital Corps. Mercury astronaut Lt. Cmdr. Scott Carpenter, USN was selected for the mission but would sit out the first phase of SEALAB after suffering injuries in a motorbike accident on Bermuda.

The aquanauts would take daily swims outside the habitat collecting Marine specimens, feeding fish, and conducting physiological tests.

They enjoyed daily meals that included corned beef hash, Chinese food, tamales, roast beef, sweet potatoes, and coffee. Other SEALAB "amenities" included warm showers, books, a chess board and communication devices connecting them "topside" where Bond and medical officer Walter Mazzone monitored the crew around the clock.

Due to the helium rich atmosphere of the habitat, the aquanauts spoke in high-pitched squeaks and were required to use a "speech normalizer" to ensure intelligibility in communicating topside. Andy Anderson would famously inaugurate the system with a rendition of "O Sole of Mio."

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Navy Researchers and Collaborators Testing a Vaccine for Traveler's Diarrhea

Story by Doris Ryan, Naval Medical Research Center Public Affairs

SILVER SPRING, Md. – A vaccine to protect against *Campylobacter jejuni* was recently approved for human clinical trials by the Food and Drug Administration. Researchers at the Naval Medical Research Center (NMRC) began an FDA approved phase 1 clinical trial for a *C. jejuni* vaccine at the Walter Reed Army Research Institute Clinical Trials Center in April. *C. jejuni* is a global health problem and is a leading cause of diarrhea in deployed military personnel and international travelers.

Dr. Patricia Guerry, a senior scientist at NMRC, was one of the first molecular microbiologists to address the health concerns of *Campylobacter* in the 1980s, a decade after it was first discovered and recognized as a cause of human diseases. Teaming up with Dr. Mario Monteiro, from the University of Guelph in Ontario, Canada, Guerry oversaw the design and development of a prototype *C. jejuni* vaccine.

“Work on conjugate vaccines started in 2004 and the initial studies were done in parallel with other vaccine approaches. These initial promising studies

demonstrated immunogenicity in mice,” said Guerry. “A prototype vaccine is being used in this clinical trial with the primary aim of evaluating the safety of this vaccine and immune responses.”

This phase 1 study will enroll up to 48 healthy volunteers to determine safety and dosing levels. Cmdr. Robert Gormley is leading the study.

“We are vaccinating up to 48 volunteers with an injection to the upper arm,” Gormley said. “Since this is a dose escalation study, we are vaccinating sixteen volunteers with a low dose before subsequently vaccinating an additional two groups of sixteen each at higher doses. It is hoped that at the end of the study, the results will allow the research team to take the vaccine into a phase 2 study where volunteers will be vaccinated to see if it protects against *Campylobacter* in a human challenge study.”

He added that the emerging epidemiology and understanding of campylobacter-attributed burden in military personnel, travelers and global populations combined with the promising development of the

Campylobacter vaccine may lead to wider interest in the development of a vaccine against this disease.

Diarrhea has historically been a substantial cause of morbidity for deployed U.S. military personnel and continues to the present day. The NMRC Enteric Diseases Department's research program is centered on the development of effective countermeasures to prevent or abate bacterial diarrhea, with most efforts aimed at vaccine research and development. NMRC researchers have identified many surface structures of the bacteria, found how it invades human cells, and characterized many aspects of the immune response.

This work continues with the use of comparative genomics, expression arrays, and studies to try to better understand the protective immune response, all of which will enable researchers to develop an effective vaccine.

Captain George Bond and the World of Undersea Research, Part II

(continued from page 11)

Although scheduled to last three weeks, the SEALAB experiment shortened to ten days on account of an approaching hurricane. The SEALAB habitat was raised three feet an hour and adjustments were made to breathing gas mixture, accordingly.

Before reaching the surface the aquanauts spent two days in a submersible decompression chamber before being released.

Despite suffering mild nitrogen narcosis, the aquanauts did not experience any major physiological effects of exposure

to deep sea conditions. The SEALAB experiment demonstrated that humans could fully integrate with the ocean environment and complete daily tasks while submerged 200 feet below the surface.

The first government-sponsored underwater habitat, SEALAB was deemed a resounding success and in January 1965 the Navy authorized the continuation of the project.



Navy Researcher Participates in Career Workshop at University of Michigan

Story courtesy of Naval Medical Research Center Public Affairs



Lt. Cmdr. Maya Williams fields questions about her career as a microbiologist in the U.S. Navy from graduate students in the Cellular and Molecular Biology Program at the University of Michigan. (Photo courtesy of Naval Medical Research Center Public Affairs)

SILVER SPRING, Md. – A researcher from the Naval Medical Research Center (NMRC) had the opportunity to participate in the University of Michigan's Career Workshop, May 17.

Lt. Cmdr. Maya Williams, a 2004 UM graduate, was a panel member at the annual retreat for the university's Cellular and Molecular Biology (CMB) Graduate program. Williams is a microbiologist who leads NMRC's Viral and Rickettsial Diseases Department.

"The Cellular and Molecular Biology Graduate program at the University of Michigan is an interdisciplinary Ph.D. granting program that allows students to choose from over 150 faculty laboratories throughout several departments at the university," said Williams. "The recently formed CMB career committee identifies

and researches possible career paths, then invites panelists to take part in interactive discussions about their career choices and experiences."

Williams provided a brief overview of her career as a U.S. Navy microbiologist and then met with students in small groups to answer more specific questions.

"I had the opportunity to talk to over 60 students and discuss a career in the Navy as a researcher," said Williams. "I shared with them my experiences as a virologist at NMRC; the U.S. Naval Medical Research Unit No. 2 in Jakarta, Indonesia; and the U.S. Naval Medical Research Unit No. 6 in Lima, Peru. The students were surprised and intrigued at the wide array of unique research opportunities in the U.S. Navy. Several students seemed interested in exploring this career path."

Previous workshops have focused on careers in academic science, biotech, pharmacology and technology transfer. For the career panel at this year's CMB retreat the committee wanted to highlight careers making an impact.

Other panel members included the Associate Research Director for Citizens United for Research in Epilepsy and Assistant Professors from Vassar College.

The NMRC Viral and Rickettsial Diseases Department is divided into two divisions. The primary focus of the Viral Diseases Division is on the development of a vaccine to prevent dengue fever; the main objective of the Rickettsial Diseases Division is to develop a scrub typhus vaccine.

NAMRU-Dayton Staff Recognized at the 85th Annual AsMA Meeting

Story by Dr. Richard Arnold, NAMRU-Dayton Public Affairs



The 2014 Fellows of the Aerospace Medical Association were acknowledged during the Honors Night Banquet. Recently elected, Dr. Lynn Caldwell (Front, second from left) of NAMRU-Dayton. (Photo courtesy of NAMRU-Dayton Public Affairs)

DAYTON, Ohio -- During the 85th annual scientific meeting of the Aerospace Medical Association (AsMA), several members of the scientific staff from the Naval Medical Research Unit Dayton (NAMRU-D) highlighted aeromedical research through a variety of workshops, scientific presentations, and posters. The meeting was held in San Diego, California, May 15.

Dr. Lynn Caldwell co-lead a workshop with Dr. John Caldwell on "Aircrew Fatigue; Causes, consequences, and countermeasures." This fatigue workshop has been presented at 12 successive meetings of AsMA. This year 54 conferees attended the workshop.

Several presentations and posters covering recent research on pilot spatial disorientation were presented by NAMRU-D staff, including: Cmdr. Rich

Folga, Dr. Cristina Kirkendall, Dr. Hank Williams, and Dr. Rick Arnold. Motion sickness countermeasures research was presented by Cmdr. Rich Folga, Ms. Jacqueline Gomez, and Mr. Dan Geyer. Cmdr. Mike Reddix presented his research to assess new computerized color vision tests for potential application in aviation medical screening. Dr. Jeff Phillips, Mr. Eric Robinson, and Mrs. Stephanie Warner presented lectures and posters describing research on effects of hypoxia on pilot performance and research to assess the efficacy of various sensors for in-flight hypoxia detection.

Two NAMRU-D staff were recognized by their professional colleagues at the 2014 meeting. Cmdr. Rich Folga assumed his elected duties as incoming President of the Aerospace Physiology Society, a constituent organization of AsMA. Dr. Lynn Caldwell was recognized for her

many years of outstanding research on fatigue mechanisms countermeasures by her election as a Fellow of the Aerospace Medical Association. She was recognized along with the others in her Fellows class of 2014 during the AsMA Honors Night Banquet.

The annual meeting of AsMA provided NAMRU-D scientists a unique opportunity to interact with their peers in aeromedical research from the sister services and from across the national and international aerospace communities. They also were able to interact with fleet stakeholders and research sponsors, ensuring the laboratory's research remains relevant to fleet requirements and, just as critically, supported by funding sponsors. Next year's meeting will be held May 10-14 2015 in Orlando, Florida.

NAMRU-3 Staff Participate in Cairo U.S. Embassy Mission Day

Story courtesy of NAMRU-3 Public Affairs



NAMRU-3's Mr. Hakam (left) discusses NAMRU-3's research activities with U.S. Embassy staff and family members. (Photo courtesy of NAMRU-3 Public Affairs)

CAIRO – Staff members from the U.S. Naval Medical Research Unit No. Three (NAMRU-3) participated in the U.S. Embassy Mission Day held on the Embassy grounds, May 11.

NAMRU-3's Hospital Corpsman first class, Gordon Lott, who represented NAMRU-3 at the Embassy planning meetings, organized and manned the NAMRU-3 booth at the event, with assistance from the Research Science Directorates' Ms. Elshaimaa Nouredin, Ms. Mireille Kamal, and Mr. Abdelhakam AbdelFattah.

There was a display of a microscope, slides, test tubes with parasites and posters and pictures to show some of the

fascinating work that NAMRU-3 does. Visitors could view slides and talk to the laboratorians about their work.

There was also a poster of NAMRU-3's historic buildings; current posters of lab work; and a section highlighting the life of Ibrahim Helmy, NAMRU-3 naturalist.

Sports tournaments were also part of the event. Fielding two soccer teams and several ace ping pong players, NAMRU-3 played in the tournament with NAMRU-3's Army Specialist Mark Cooper coaching both soccer teams and Rafi George making it to the ping pong semifinals.

"Even though we didn't get the cup, we

did well and enjoyed the camaraderie and team spirit that NAMRU-3 players showed," said Cooper adding, "Hopefully the teams will continue to play and be even better for next year's tournament."

NAMRU-3 staff attendees enjoyed live music; saw a talent show, folklore presentation, and sports events; bought souvenirs, and tasted different cuisines.

NAMRU-3's Nora Kamal said, "It didn't feel crowded because the events were spread out over the Mission grounds and in the auditorium and gazebo."

Notre Dame Researchers Seek Collaborations on Pathogen Diagnostics at Naval Medical Research Center IDD Seminar

Story courtesy of Naval Medical Research Center Public Affairs



Dr. Sunny Shah (left), Dr. Satyajyoti Senapati (middle), and Dr. Shuenn-Jue Wu, meet in one of the Infectious Diseases Department labs at Naval Medical Research Center (NMRC), May 16. Shah and Satyajyoti, researchers from the University of Notre Dame's Department of Chemical and Biomolecular Engineering, were guest speakers for a seminar at NMRC. (Photo by Mikelle D. Smith, Naval Medical Research Center Public Affairs)

SILVER SPRING, Md., -- Naval Medical Research Center's Infectious Diseases Department (IDD) hosted a seminar in the Behnke Auditorium, May 16.

Dr. Sunny Shah and Dr. Satyajyoti Senapati from the University of Notre Dame's Department of Chemical and Biomolecular Engineering, presented work on the development of an integrated diagnostic platform capable of extracting, concentrating, and detecting pathogenic biomarkers all on a single integrated biochip. The negatively charged biomarkers are extracted using an electric field through an agarose gel.

"To concentrate, the team creates a "depletion region" to trap the biomarkers in a single location while the sensing is performed by detecting hybridization of biomarkers to target-specific probes attached to a commercially available

nanomembrane," said Shah. "The most unique feature of our platform is not only its low cost but also its ability to go from sample to result in 30 minutes."

According to Senapati, the simplicity and user-friendliness of this polymer-based integrated platform could make it suitable for field-based biodetection by DoD personnel.

While visiting NMRC, Shah and Senapati met with several researchers to identify possible opportunities for collaborations. Several groups expressed interest in the diagnostic platform including detection of wound infections and early screening of microRNA markers, as well as detection of other bacterial and fungal pathogens of military interest.

NMRC scientists were able to provide the UND team with scientific and

operational goals that may guide device co-development efforts and that can eventually benefit the military.

Dr. Shuenn-Jue Wu, the host of the IDD Seminar from NMRC's Viral & Rickettsial Diseases Department, has collaborated with Notre Dame for submission of an NIH R01 proposal and has laid the foundation for future collaborative efforts.

For future collaborations, the two groups are currently working on establishing a Cooperative Research & Development Agreement to begin testing the diagnostic platform on dengue virus samples followed by continued product development to meet military requirements as well as FDA licensure and potential field applications for pathogen detection.

NMRC Recognizes Hospital Corpsman in R&D

Story by Mikelle D. Smith, Naval Medical Research Center Public Affairs

SILVER SPRING, Md., -- They are one of the largest Navy enlisted ratings; vastly, they can be found everywhere -- forward deployed on battlefields with Marines, in hospital surgical operating rooms helping in life or death procedures, on Navy warships sustaining the health of crews as large as 6,000; and, even in laboratories assisting researchers on the verge of generating lifesaving vaccines. Who are they? They are Hospital Corpsman (HM).

Since 1898, HM's have been an integral component during naval conflicts. Many times sacrificing their lives to complete procedures saving shipmates, The HM rate consists of 38 different classifications ranging from aviation medicine techs to pharmacy and lab techs. This makes the HM rating one of the most diverse in the fleet.

One very distinctive setting offered to HMs lies in the research and development arena of Navy Medicine.

"I am an aerospace medicine technician,"

said Hospital Corpsman 3rd Class (SW) Jedidayah Merriweather, a HM working in Naval Medical Research Center's (NMRC) Undersea Medicine Department. "Working in R&D has been a challenging and privileging experience. I've learned things outside my specialty, that I feel have opened windows of knowledge. I didn't have a ton of expectations, but I always try to be open to learning and integrating into the working environment. It was a smooth adjustment."

Slightly different from working in a clinical setting, R&D HMs are exposed to a variety of new things, many of them educational and daunting, depending on the experience the HM.

"In the hospital setting you are working with patients," said Hospital Corpsman 3rd Class Christel Francios, a HM working in NMRC's administration department. "Even though I don't work directly in the labs, just being in this setting has shown me so much about the difference in R&D. I call the R&D community silent heroes."

They are behind the scenes developing new procedures and doing different experiments to help military members."

Some of the duties a HM in R&D can perform consists of performing laboratory tests and operating highly technical laboratory equipment, executing preventive maintenance repairs on biomedical equipment, maintaining vitals on various experimental models, and inserting needles and drawing samples.

"It is good to experience R&D," said Chief Hospital Corpsman Mario Espino, part of NMRC's Biological Defense Research Department (BDRD). "When HMs come to R&D, they must stay proficient in their respective NECs. I recommend that HMs interested in R&D be seasoned. Those who have been in the fleet and have extensive clinical experience."

June 17 marked 116 years since the establishment of the Navy Hospital Corps.



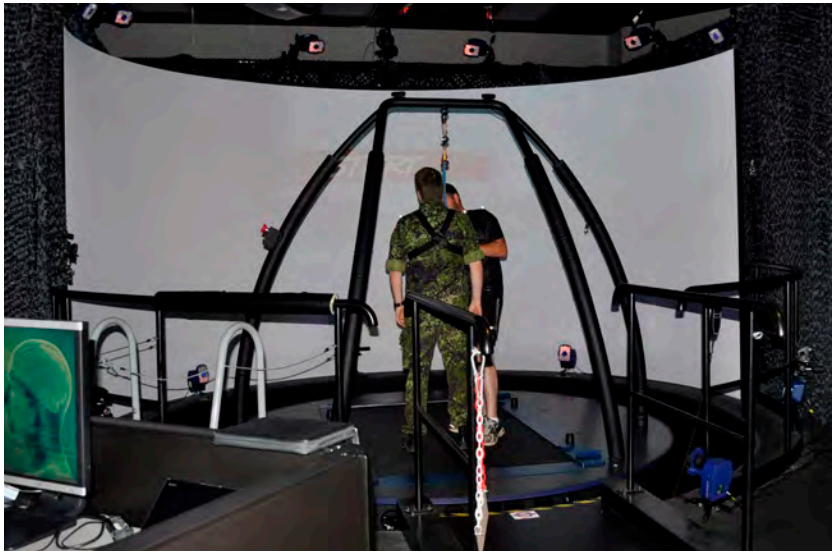
Naval Medical Research Center wishes all Hospital Corpsman Happy 116th Birthday!
June 17th, 1898



Graphic illustration by Mikelle D. Smith, Naval Medical Research Center Public Affairs

Naval Health Research Center Hosts Foreign Naval Attaches From 27 Nations

Story by Anna Hancock, Naval Health Research Center Public Affairs



(Right) Eric Duckworth, Naval Health Research Center's Warfighter Performance laboratory manager suited up Lt. Col. Jan Graugaard Kristensen from Denmark's defense attaché to test the Computer Assisted Rehabilitation Environment (CAREN) during a tour of NHRC in San Diego, May 23. (U.S. Navy photo by Anna Hancock/Released Naval Medical Research Center Public Affairs)

SAN DIEGO - NHRC hosted foreign naval attaches and their spouses from 27 nations, concluding the group's bi-annual tour of various Navy commands throughout the United States.

While at NHRC, the group toured the Warfighter Performance Lab including the CAREN and environmental chamber, and heard presentations on collaborative military operational research and development and operational infectious diseases.

Summertime is PCS Season: Are You Ready?

Greetings from the NMRC Ombudsman!

Summer is finally upon us, but for Navy families it doesn't always mean the same thing as it does to civilians. In addition to summer vacations, summertime often means PCSing. Whether it's your first move or your fifteenth, here are some suggestions to make the most of your PCS:

Start planning early and PURGE! If there is one thing I learned from our last PCS, don't wait till the last minute. I was so sad to be leaving the life and friends I had made at our last duty station that I dragged my feet on everything! In the end, we had a mad dash to organize our household goods for the movers that meant everything in the house went with us. Take some time instead to go through personal items to decide what moves with you and what can be donated or thrown out. The last thing you want is to exceed your weight allowance with items that you never use. Use a checklist like the ones provided [here](#) or [here](#), to help you stay organized.

Allow your children enough time to say good-bye to friends. Moves can be especially hard on kids. Help them to adjust to the move by helping you research your new location, giving them a special job to do on moving day, and encouraging them to keep in contact with their friends after the move. Military.com has some great tips for kids [here](#).

Reach out to resources at your receiving command including your Sponsor, the Ombudsman, and Fleet and Family Services. Your sponsor is a direct link to the command and is instrumental in helping you integrate into your new command. The Ombudsman is a great resource for your spouse in researching your new duty station. Along with Fleet & Family Services, the Ombudsman can help your family get access to information on housing, schools, spouse groups, the Commissary, etc.

Carry important documents with you including your orders, immunization records, vet records, powers of attorney, birth certificates, etc.



Have a Great Navy Day!

Allison